

SCIENCE.—SUPPLEMENT.

FRIDAY, NOVEMBER 20, 1885.

RECENT LAND LEGISLATION IN ENGLAND.

THE attitude of the English government toward the land question has undergone a thorough revolution within the last generation. Thirty years ago all propositions to reform the abuses which had grown up under the present system of land laws were uniformly met by loud protests about the sacredness of vested interests, the 'naturalness' of the existing order, and the danger to society and the government of disturbing it in any way whatever. It was insisted that it would be a violation of all sound principles of political economy for the government to go beyond its province so far as to interfere with the relation of landlord and tenant, or that of tenant and laborer, or that existing between these classes as a whole and the public. So vigorous was this protest, and so in accordance with the prevailing views as to the true sphere of government interference, that reformers were usually content to withdraw their propositions.

But this attempt to delay or prevent much-needed reforms in governmental policy was destined to bring with it the usual penalty. The disease, which might have been modified, if not entirely cured, by mild remedies rightly applied at an early stage, became more and more deep-seated and serious with every passing year. The movement for reform, too long delayed, and gathering force with every rebuff, has finally proved irresistible, and in its onward sweep has carried the government and the people far beyond what would have been necessary if legitimate demands had been satisfied in the first place.

The evidence of this is seen very plainly in the changed attitude and policy of the government, which has recently given most unmistakable evidence of its determination to take up the question in earnest, and to leave no stone unturned in order to secure a permanent settlement. In this endeavor, limited thus far chiefly to one phase of the Irish land question, it does not propose to be checked by any theoretical considerations as to the true limits of government interference. It stands ready to do any thing which promises to afford permanent or even temporary relief. If necessary, it will declare martial law. It will

confiscate landed estates by the wholesale. It will change a tenant at the will of the landlord into a tenant at his own will. It will convert a tenant into a proprietor. It will lend money, to those wishing to buy land, at low rates of interest and on insufficient security. It will destroy all freedom of contract in regard to the use of land. It has, indeed, already done all these things.

The proof of these statements is to be found in the history of recent acts of parliament on the land question.¹ It is impossible to convey a clear idea of such a complicated problem as the Irish land question in a brief space, but one or two of the most important points may be set forth which will illustrate the far-reaching sweep of recent legislation.

The act which really introduced the new policy was that of 1870, which declared whole classes of contracts hitherto in vogue between landlord and tenant to be void both in law and equity, and established the novel principle of compensation for disturbance or damages for eviction. It took from the landlord the right to dismiss a tenant so long as he paid his rent. It secured to the latter a just compensation for all improvements, whether made with or without the consent of the landlord, and conferred on him the power to sell his tenant-right, with all the privileges pertaining thereto. This act was in form, therefore, a great encroachment on the control of the landlord over his property. But as it did not regulate the amount of rent which the latter might exact, it left him, after all, in practical control of his property, since he might raise the rent at will, and evict the tenant if he did not choose to pay it. It rather aggravated than lessened the difficulty.

The act of 1881, which was the most important act relating to Ireland, was the logical outcome of the act of 1870. It finished the work which the latter had begun by establishing a series of optional courts for regulating rents. They are optional in the sense that either landlord or tenant may resort to them in case he is not contented with the terms of a lease. The court, in case of a resort to it, fixes the rent which the landlord may exact. When the rent is thus judicially fixed, it is to hold good for a period of fifteen years, when, by a similar process, it may be modified to suit altered circumstances during another period of like duration. As long as the tenant pays the rent

¹ *Economic aspect of recent legislation.* By WILLIAM WATT. London, Longmans, Green, & Co., 1885.

thus fixed, he cannot be disturbed in possession by the landlord, except on the payment of a fine known as 'compensation for disturbance.' The tenant may sell his tenant-right to another, who has then all the privileges as against the landlord which the original tenant enjoyed. In this way are secured the three 'F's,'—Fair rents, Fixity of tenure, and Free sale. In this way, also, the landlord is almost completely deprived of any real control of his property.

The act has not been, by any means, a dead letter. Eighty-five sub-commissioners were, in 1883, engaged in the work of determining 'fair rents,' and the number was afterwards somewhat increased. As a result a general reduction in rent was effected, amounting on the average to about twenty per cent, and in some cases to thirty per cent and upwards. This virtually amounts to a confiscation of from one-fifth to one-third of the capitalized value of landed estates in Ireland. Its moral effect may lead to a still further reduction in value: for who can be sure that a government which has confiscated one-fifth of the estate will not subsequently confiscate it all if peace and quiet shall not follow as a result of the present measure?

Both acts above mentioned contained provisions intended to favor the growth of a class of peasant proprietors. The purchase of holdings by tenants in the case of estates which fell under the jurisdiction of the encumbered estates court, was favored by the authority given to the Irish board of works, in 1870, to advance two-thirds (increased in 1881 to three-fourths) of the purchase-money at three and a half per cent interest, to be repaid at intervals during a period of thirty-five years. It has already been proposed to extend this authority so as to let them advance all the purchase-money at a lower rate of interest, for a longer time.

He would be a bold man indeed who would assert that these acts, sweeping as they are, constitute any real contribution to the actual solution of the Irish problem. Such a statement could only be made by one who had a political point to gain, or who had given but little attention to the actual investigation, even at second hand, of the social and economic conditions which prevail over a large part of Ireland. The difficulty lies deeper than any mere landlordism, and it will not be long until the Irish land question will be again to the front, and that, too, whether Ireland be under English or Irish rule.

These acts, however, mark a new era in English legislation on this subject. They indicate (and herein lies the hopeful feature of the case) that the English people are now ready to take up this and similar questions in earnest. They are now

willing to throw to the winds all doctrinaire theories of *laissez-faireism*, to disregard alarmist speeches about approaching communism or socialism, and to close their ears to the old song about the supreme sacredness of private property. They are now determined, after getting all the light they possibly can from economic and historical science, to make use of the only means which promises any solution whatever, viz., that of actual experimentation. The outcome of the recent experiments in Ireland, to which the late acts have been practically limited, will afford great assistance in the solution of the Scottish and English land questions, which must soon come to the front.

E. J. JAMES.

THE BLACKFOOT TRIBES.

AT the late meeting of the British association for the advancement of science, a committee of the anthropological section presented a report (prepared by Mr. Horatio Hale) on the tribes of the noted Blackfoot confederacy. The report comprises many particulars relating to the origin and history of the tribes, the character of the people, their mythology, languages, and mode of government, and their present condition. The facts have been mostly derived from correspondence with missionaries now residing among the people, and from official documents, with some memoranda made by the author of the report during an exploring tour in Oregon. Only a brief abstract of the information thus brought together can here be given.

The tribes composing the confederacy are, or rather were, five in number. Three of these, forming the nucleus of the whole body, are the original Blackfoot tribes, who speak the same language, and regard themselves as descended from three brothers. These are the Siksika, or Blackfeet proper; the Kena, or Blood Indians; and the Piekané, or Piegans (pronounced Peegans),—a name which is sometimes corrupted to 'Pagan Indians.' To these were added, when the confederacy was at the height of its power, two other tribes,—the Sarcees, who joined them from the north; and the Atsinas, who came under their protection from the south. The Sarcees are a branch of the great Athabaskan or Tinné family, which is spread over the northern portion of the continent, in contact with the Eskimo. The Atsinas, otherwise known as Fall Indians and Gros Ventres, are shown by their language to be akin to the Arapohoes, who once wandered over the Missouri plains, but are now settled on a reservation in the Indian Territory.

The dividing line between the United States and

Canada has cut the confederacy in two. Most of the Piegiens, with the few surviving Atsinas, reside on the American side, where a large reservation has been set apart for them, along the head waters of the Missouri River. The residue of the Piegiens, with the Siksika, Kena, and Sarcee bands, dwell on reserves laid off for them near the southern boundary of the Canadian north-west territories, adjacent to the Rocky Mountains. Thus the lands occupied by these tribes, though much diminished in extent, are in the same region which they held fifty years ago, when their confederacy was the dominant power among all the Indians west of the Mississippi. At that period their numbers were reckoned at thirty thousand souls. Various causes, but more especially the ravages of the small-pox, have greatly reduced them. The population of the four Canadian reserves is computed at about 6,500, divided as follows: Blackfeet (Siksika), 2,400; Bloods (Kena), 2,800; Piegiens (Piekanè), 800; Sarcees, 500. On the American reservation there are stated to be about 2,300, mostly Piegiens, with some Sarcees. This would bring up the total number of Indians in these tribes to nearly 9,000 souls.

The country inhabited by the Blackfeet was the favorite resort of the buffalo. The vast herds which roamed the plains, or found shelter during the winter in the woody recesses of the mountains, furnished the tribes not merely with food, but with the skins which made their tents and their clothing. The complete extermination of these animals, which has taken place during the last five years, has made an entire change in the mode of life of these Indians. From a race of wandering hunters, they have become a community of farmers, and, as the official reports show, have displayed a remarkable aptitude for the arts of civilized life. Under the direction of superintendents and farm instructors appointed by the Canadian government, they have erected comfortable log-houses, well furnished with cooking-stoves, table-ware, and other household appliances, and have raised large quantities of potatoes, barley, oats, turnips, and other esculents. They have shown themselves always orderly and prudent in their dealings with the government and the white settlers.

The Blackfoot language was formerly supposed to be entirely different from any of the languages spoken by the surrounding tribes. This was the report of the first explorers. Further investigations have shown that this opinion was not well founded. The language proves to be Algonkin in its grammar, but to be in a large part of its vocabulary widely different from other Algonkin tongues. It is evidently a mixed language, of the

kind which results from the conquest of one tribe or nation by another speaking a different tongue. What is known of the history of the Blackfeet shows how this conquest and intermixture may have taken place. The Blackfoot tribes formerly inhabited the Red River country, from which, as there is good reason to believe, they were driven westward by the Crees, who formerly dwelt in Labrador and about Hudson Bay, but who now occupy the ancient homes of the Blackfeet along the Red River and the Saskatchewan. The Blackfeet, when they retreated to their final refuge in the valleys and plains along the eastern slope of the Rocky Mountains, had in their turn to overcome and absorb the population which they found there. The traditions of the people, and other circumstances, seem to show that the tribe thus conquered—and whose language probably furnished the foreign portion of the Blackfoot vocabulary—had come from the west or Oregon side of the mountains.

In further confirmation of this view, it is shown that the Blackfeet have not only a mixed language, but also a mixed religion. While their legendary cosmogony and their principal deities are purely Algonkin, their chief religious ceremony, the famous sun-dance, to which they are fanatically devoted,—the most extraordinary trial of faith and of endurance known among the western Indians,—is clearly of exotic origin. It is wholly unknown to the other Algonkin tribes, except to a few Crees, who have apparently learned it from the Blackfeet. It also prevails among the Dakotas, but chiefly in the western bands nearest to the mountains and to the Blackfeet.

The form of government among the Blackfoot tribes, as among the Algonkin tribes in general, is very simple. Each tribe has a head chief, and each of the bands composing a tribe has its subordinate chief; but the authority of these chiefs is little more than nominal. Their prerogatives are chiefly those of directing the movements of a camp, of presiding in council, and of representing the tribe or band in conferences with other communities. The term 'confederacy,' applied to the union of the Blackfoot tribes, is somewhat misleading. They have no proper inter-tribal league, like that of the Iroquois nations. There is simply a good understanding among them, arising partly from the bond of kinship, and partly from a sense of mutual dependence. Even the three proper Blackfoot tribes can hardly be said to have a general name for their whole community, though they sometimes speak of themselves as *Sawketakix*, or 'men of the plains,' and occasionally as *Nelsetoyè*, or 'people who speak one language.'

The foregoing, as has been stated, is only a brief summary of the contents of this report, which is given in an abridged form in *Nature*, and will doubtless hereafter be published in full by the association. The facts which it presents disclose in the people of this aboriginal Switzerland qualities much above the average, and should lead to further inquiry into their history and characteristics.

SOME REACTION-TIME STUDIES.

THE study of reaction times derives a great interest and importance from the fact that by this means another bond of relation between mind and matter becomes apparent. All material actions require time. Mental actions as well, from the perception of a sensation to the highest expression of the intellect that offers itself to experimental investigation, also occupy an appreciable amount of time. This mental time is not constant as the time of a falling body in space, but is affected by slight variations in bodily and mental conditions.

M. Beaunis¹ has studied the effect of one important mental requisite, namely, expectation. The reactions were made to a visual sensation, and 36 persons besides himself (most of whom were medical students) were experimented upon. A signal (*advertisement*) was given, whereupon the subject held himself in readiness for the flash of light, so as to react by pressing the key as quickly as possible. The time between the signal and the flash of light is the *expectation time*; that between the light and the seeing of it, the *reaction time*. The expectation time was varied from .3 sec. to 3 sec., and the following conclusions were reached:—

(1) As others had already shown, the reaction time is shorter if a signal is given than if it is not.

(2) The *longer* the expectation time, the *shorter* the reaction time. The experiment may be compared to the problem of finding an object in a dark room by bringing the light of a bull's-eye lantern upon it. When there is no signal, that is, when directed to find the object without time to get the lantern ready, it would evidently take longer to find the object than it would if time were given to get the lantern in position; and the longer this time, the quicker would the object be found. The attention acts as the bull's-eye lantern.

(3) The difference between the minimum and maximum times is greater than when a signal is not given, and increases as the expectation time increases.

(4) The influence of several individual differences, etc., was evident. In two of the medical

students the reactions were always slow. In many it was very quick. M. Beaunis was the only person who was accustomed to this kind of experimentation, and in his case a much smaller percentage of experiments had to be thrown out as faulty than in the others. The effect of health was marked in one case. Feeling slightly indisposed in the morning, M. Beaunis's reaction time was .37 sec., i.e., abnormally slow. In the afternoon it was .222 sec., showing that the normal condition was returning. Two hours later it was normal (.160 sec.).

An extremely interesting research is that of Guiccardi and Ranzi,² in which they compare the reaction time to a sound impression in normal persons with the same in patients suffering from auditory hallucinations. The reaction time is obtained somewhat in this way. The making of the sound which serves as the stimulus sets into motion a chronoscope, which the subject stops, as soon as the sound is heard, by pressing an electric key. In this way the following table, giving in seconds the time necessary for hearing the sound, was prepared:—

	Normal.	Hallucinated.
Average of 10 shortest reactions out of 50	.1012	.0947
Average variation	.0333	.0346
Average of remaining 40 reactions	.1259	.1403
Average variation	.0192	.0306
Average of all 50 reactions	.1135	.1175
Minimum time	.0585	.0603
Maximum time	.1731	.2287

Taking the mean of the 10 shortest reactions, or comparing the minimum reaction time, we see that those suffering from hallucination are quicker in their perception of sound; and this difference must be ascribed to morbid irritability of these centres of apperception. On the other hand, the other averages, and especially the average divergence from the mean reaction time, i.e., the average variation, and the maximum time, show that normal persons can command a steadiness and regularity of the attention, which is impossible in those afflicted with sound hallucinations.

In many cases the reaction time is and must be studied under rather artificial conditions. This circumstance is apt to weaken inferences drawn from such studies to similar processes in normal mental activity. In a recent study³ of the time necessary for recognizing letters, numbers, colors, etc., this difficulty has been successfully overcome. Small letters were fastened to a revolving drum, and looked at through a slit of variable width in a screen held before the letters. The letters are

¹ *Revue philosophique*, September, 1885.

² "Ueber die seit der erkennung und benennung von schriftzeichen, bildern und farben," by J. M. Cottell. *Philosophische studien* (Wundt), vol. II., No. 4. Leipzig, 1880. The work was done in the psychophysical laboratory of Johns Hopkins university.

³ *Revue philosophique*, September, 1885.

adjusted at such distances that, with a slit 1 cm. wide, one letter is always in sight; if 2 cm. wide, two letters; and so on. By varying the rate of rotation of the drum and the width of the slit, the time necessary for the reading of a single letter under various circumstances was obtained. Up to a certain limit, this time is *shortened* as the slit is *widened*. This fact is to be interpreted as follows: In reading these letters, two time elements are involved: 1°, that of recognizing the letter; and, 2°, that of naming it. The association between the sight of the letter and its name is so close, that the latter action is performed automatically: hence, if the letters follow one another with so great a rapidity that the first can be named while the second is being recognized, the average time for reading a single letter will evidently be shortened; and the experiments show that this power of carrying over one letter while pronouncing the preceding can be active when three, or in the case of several persons when four or five, letters were present to the eye at once.

Another series of experiments showed that it takes longer to count letters than to name them; and if the letters are counted in groups of two, or better still of three, instead of singly, the counting time is reduced.

The time necessary for reading words in different languages was also studied; and the general result is, that the maximum rapidity with which words forming sentences can be read varies directly with one's acquaintance with the language. A German read 100 German words in 18.4 sec., but 100 English words in 29.1 sec. This method offers a means of objectively testing a person's acquaintance with a foreign language. If the words are read backwards (thus eliminating the sense of the passage, and reducing the process to mere reading), the time is lengthened; but the smaller one's acquaintance with the language, the less difference in time between reading it forwards and backwards.

It seems that among those tested, women read faster than men; and Germans take longer to spell their words than English-speaking persons.

If small strips of colors are used, instead of letters, it takes almost twice as long to name the true color as it would to name a letter; and this difference in time is due to the greater difficulty in finding the proper name. In this case the association between the color and its name is a loose one. These studies will be continued in the next number of the *Studien*. J. J.

NEXT year's exhibition at South Kensington, of the products of India and the colonies, is to be the last of the sort in that locality. Liverpool is to have an exhibition of shipping and means of transport.

THE LAWS OF TEMPERATURE IN THE AUSTRIAN ALPS.

DR. JULIUS HANN of Vienna, editor of the Austrian meteorological journal and a leader among European meteorologists, has lately completed his detailed studies on 'Die temperaturverhältnisse der oesterreichischen alpenländer,' which are now published in three parts in the *Sitzungsberichte* of the Vienna academy of sciences. All available observations are included in the reductions, and the results are stated with great detail. As to method, attention should be emphatically called to the reduction to normal means; that is, to the mean of some definite series of years, in this case the thirty years from 1851 to 1880: thus, if a station had records from 1855 to 1884, the mean of these thirty years' observations was reduced to what it most probably would be for 1851-1880 by the use of a correction determined from neighboring stations where the records covered both periods; that is, from 1850 to 1884. Wild of Russia, and Buchan of Scotland, have employed this method for low-level stations; Hann is the first to show its applicability to mountain stations also. As to results, one of the most striking is the appearance of the *increase* of temperature upwards in the thirty years' winter mean of valley and mountain stations as a persistent climatic element. Observations of late years have shown that this inversion of temperature—extreme cold in valleys with moderate cold on mountains—was common enough in the winter during anticyclonic or high-pressure weather, but it is here first shown to be a persistent inversion characteristic of the winter mean. Hann was also the first to explain, several years ago, the peculiarities of the warm winter alpine wind known as the *föhn*, which depends directly on the unduly high temperature of the upper air in winter.

BEN NEVIS METEOROLOGICAL OBSERVATORY.

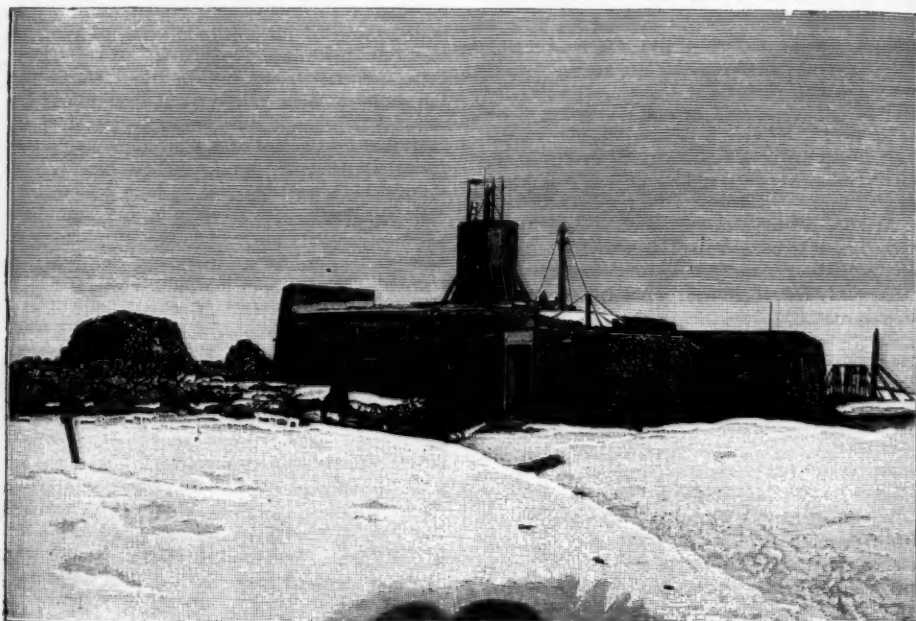
THE highest of the Scotch mountains, Ben Nevis, reaches an altitude of four thousand four hundred feet; less than five miles away, the sea stretches a long arm up the submerged portion of the great glen to Fort William. On this well-chosen summit, in the path of many a storm from the Atlantic, the Scottish meteorological society has built an observatory, here figured, for the direct study of the conditions of the upper air, which observations at their low-lying stations must leave to inference. Most of the few mountain observatories of Europe stand at a greater height than the summit of the Ben, but none of

them have the peculiarity of being immediately by the sea, and none are so frequently visited by storms. Hourly observations of the usual meteorological elements are taken by Mr. Omond, the superintendent, and his two assistants; and, if the observatory be maintained as well as it has been begun, its records must yield results of the greatest value in the study of the weather. Unfortunately, its support still depends only on general subscription. Among the generalizations thus far made for Ben Nevis by Mr. Buchan, secretary of the Scottish society, we may quote the following:

are prevaillingly cold, on account of the rapid loss of heat by radiation from the ground through the clear, dry air. Mountains, therefore, have a meteorology of their own, and one that is well worth studying.

THE ORIGIN OF MEDIAEVAL UNIVERSITIES.

AN important contribution to the history of higher education has been made in Germany by the publication of a work¹ on 'The mediaeval uni-



BEN NEVIS METEOROLOGICAL OBSERVATORY. (London graphic.)

The mean velocity of the wind is greater at night than at day, this being the reverse of the variation found at low-level stations, but in accordance with the results of other mountain observatories and with theoretical deductions; diurnal variations of temperature are small, the change from warm to cold weather being very largely dependent on the passage of cyclonic storms; the temperature is abnormally high during the passage of an anticyclone, or area of high atmospheric pressure, in which the air descends from great altitudes, and is warmed by compression; this, like the variation of the wind, being the reverse of what obtains at lower levels, where anticyclones

versities prior to 1400.' Its author is *unterarchivar* of the papal see, P. Heinrich Denifle, and he has brought the thorough methods of research which are characteristic of the Germans to the discussion of the ample stores of information which are to be found in the archives of Rome, Florence, Paris, Leipzig, Munich, Erlangen, and other ancient seats of learning. The volume before us includes more than eight hundred pages, but it is only one-third of the proposed work. It discusses the origin of the universities in the middle ages; and their organization and constitution are to be considered

Die universitäten des mittelalters bis 1400. Von P. HEINRICH DENIFLE. Band I. Berlin, Weidmann, 1885.

in the second part, and in the third many subordinate subjects. Our space will not allow us to do justice to the erudition of this great work, but we can, perhaps, exhibit its scope so that those who are interested in the circumstances which gave birth to the progenitors of our modern institutions may understand how rich a storehouse of learning has been provided for them.

The writer begins with the study of the now venerable words, *studium generale* and *universitas*. Both terms were in vogue as early as 1300. The former phrase has not been found in use as the name of a high school prior to 1333-34, when it is applied to the school of Vercelli: the phrase *studium universale* is a little older. *Universitas* (as other writers, following Du Cange or the lexicographers, have pointed out) had originally no special reference to a seat of learning. It signified very nearly what we call a corporation, and was almost synonymous with such words as *societas*, *collegium*, *corpus*, *communio*, *consortium*. Gradually it came to be employed for the corporation devoted to the pursuit of knowledge, and then was restricted to this use, so that *universitas oxoniensis* was interchangeable with *studium oxoniense*; but the proper designation of a mediaeval high school was *studium generale*, or *studium* alone. As early as 1254, the word 'university' is used in Paris as equivalent to 'college.' The definition of Hugolinus is worth quoting: '*Universitas est plurimum corporum collectio inter se distantium uno nomine specialiter eis deputato.*'

From this preliminary inquiry, the writer proceeds to the history of the universities of Paris and Bologna, which, in his view, require more elaborate treatment than the other high schools, not only because of their extraordinary direct influence, but because their constitution is the key to that of many later foundations. The school at Salerno, older than the two just named, was quite subordinate in general influence. Savigny's theory that universities, by a sort of natural evolution, were developed around the chair of an illustrious teacher, is vigorously opposed by Denifle, who recognizes many factors as co-working in the origin of an enduring university. New methods of instruction, and privileges accorded by authority, seem to our author most potent influences; but even more important was the forming of corporations for the promotion of study, or, in other words, the introduction of combined or co-operative methods of instruction. The different modes in which such combinations were secured in Paris and Bologna are discussed at much length. After considering the origin of these typical foundations, in whose usages of five or six centuries ago may be found the germ of customs

and laws still recognized, even in the disjointed members of American universities, the author takes up, one by one, all the other European universities of the period he is considering. He makes four groups,—schools, improperly called universities; high schools without letters of authorization; high schools which were established by papal briefs; and high schools which received their privileges from papal and princely authority. Finally, the relation of universities to pre-existent schools is very fully discussed.

We have said enough to show that the writer is original, and to a considerable degree controversial. Whatever criticism his views may call forth,—and they are likely to be most closely scrutinized in Germany,—his diligence in the collection of facts, his comprehensive views, and his abundant references to original authorities, entitle him to the highest praise. There is good reason to think that he is right in claiming that the period he is discussing, instead of belonging to the age of darkness, is one of those epochs when the mind of man has received new impulses of unusual and persistent force.

THE WASHBURN OBSERVATORY.

THE third volume of the 'Publications of the Washburn observatory,' lately issued, gives the results of the work of 1884. About 1,800 observations were made with the Repsold meridian-circle upon the gesellschaft southern fundamental stars and the Leyden Cape of Good Hope refraction-stars. The instrumental constants are given for each observing day, and an investigation of the zenith-distance micrometer-screw and of the horizontal flexure of the instrument. In the cold winter weather of Wisconsin the micrometer-springs turned out too weak to pull the slides, and had to be replaced with stiffer ones. The probable error of a single declination is now reduced to 0".4, a great improvement over that noted in vol. ii.; and a correction of $+0".90 \pm 0".026$ to the constant of the 'Pulkowa refractions' seems to be called for by the observations of 1884 to suit the atmosphere over Madison. Professor Holden expresses his continued satisfaction with the Repsold meridian-circle, and appears to be making a very thorough study of it; and in this his example might well be followed with profit by some of our older established observatories. Two determinations of the latitude by Mr. G. C. Comstock are given,—one from Professor Holden's and his own observations with the zenith-telescope, the other from his own with the prime-vertical transit, using both reflected and direct observations; the declina-

tions in both cases being those of Auwers' system. They come out respectively —

$$+ 43^{\circ} 4' 36''.97 \pm 0''.07$$

and $38''.90 \pm 0''.06$,

remarkably accordant results. The fifth part of the volume is a 'Catalogue of 1,001 southern stars for 1850.0, from observations by Signor P. Tacchini, at Palermo, in the years 1867, 1868, 1869,' by Rev. Father Hagen, S.J., and Edward S. Holden. The original observations had never been reduced to mean place; but being good ones, and in a part of the sky where needed, we have here the anomaly of European work reduced and published in this country; and Father Hagen and Professor Holden are to be highly commended for making it available, while its comparison with Oeltzen's Argelander (south) and the Washington zones served to detect many errors in these catalogues. The sixth part gives the observations of 437 southern stars made with the Washington transit-circle, and also the position of the same stars (whenever occurring) from the catalogues of Yarnall, Gould's zones, and Stone, all the positions being reduced to 1850.0 by Father Hagen. This is the first opportunity for easy comparison on a large scale between these four systems of southern declinations, and the comparison develops the following important differences of north polar-distance:—

Yarnall	= + 1''.12 (from 220 stars)
Gould (Z.C.)	= + 1''.96 (" 215 ")
Stone	= + 1''.00 (" 238 ")

It is a rather unexpected anomaly to find the Cordoba zone-catalogue and Stone differing by nearly a second, but that the Washington transit-circle should be so much out will not probably occasion much surprise to any one.

The volume closes with a count of the *Durchmusterung* stars between -2° and $+13^{\circ}$, a determination of the constants of some of the other instruments, meteorological observations for 1884, a summary of the same as taken at Madison continuously from 1853 to 1884, and is throughout a highly creditable publication. In his new field at the Lick observatory, Professor Holden will have the satisfaction of having left behind a valuable monument in these three volumes.

ARTIFICIAL WINDS.

A NOVEL apparatus has been constructed by M. Rougerie, a priest of Pamiers, in France, and brought recently before the French academy of sciences. It gives rise to air currents similar to the great winds of the earth's atmosphere, and hence its name, the *anémo-gène*. As described in *Engineering*, the apparatus consists of a small artificial terrestrial globe put into rapid rotation

in the surrounding air. In fact, it is a miniature of the earth, and by its rapid rotation it gives rise to air currents resembling the trade and other dominant winds of the world. These currents are shown by girouettes placed round the globe at small intervals, like the wind marks on the French marine charts. The apparatus reveals the following facts: The north-east and south-east trades are reproduced, and the equatorial zone of calms caused by their meeting. The gentle breezes from north and south, which disturb the equatorial calms, are also seen. So is the overthrow of the north-east trade in the south-west monsoons in the gulfs of Oman and Bengal. An ascending current in the equatorial regions is shown, and a descending current near the Azores under the centre of maximum barometrical pressure of the North Atlantic; also a descending current is indicated between St. Helena and the meridional coast of Africa, under the centre of maximum barometric pressure of the South Atlantic. At the poles there is a current descending from the zenith. The south-east trade at the Canaries is represented, while at the same time a south wind blows at the summit of the Peak of Teneriffe. Ascending currents from the east and west over Central America combine with the upper returning current of the north-east trade, thus explaining how the ashes of the volcano of Consequina, on Lake Nicaragua, were transported to Jamaica during the eruption of the 25th of February, 1835. Owing to the defects of construction, the *anémo-gène*, however, does not reproduce in a perfect fashion the variable winds between the tropic of Cancer and 50° N. lat., nor the corresponding winds between the tropic of Capricorn and 50° S. lat. In the same way the south-west and north-west winds of 50° N. and S. lat. are not very faithfully imitated.

EVERY student of biology knows of Huxley and Martin's 'Elementary text-book of biology.' Most teachers have either used the book, or been influenced by it in forming or modifying their laboratory courses. But the lack of illustrations, and brevity of the text, made the book to many almost useless. Mr. Howe's atlas (*Macmillan*) is intended to supplement the text-book in the first of these particulars. Its plates show the student exactly the points to which the text refers. It is a series of twenty-four large plates containing some five hundred figures. Each plate is accompanied by two or three pages of explanation, and the work closes with a few admirable practical directions and a bibliography. In anatomical accuracy the book is all that any one could reasonably desire. The figures, however, differ greatly in clearness and finish.

